

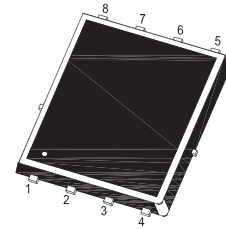
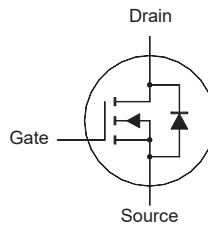
## N-Channel Enhancement Mode MOSFET

### Features

- High speed switch
- Halogen and Antimony Free(HAF), RoHS compliant

### Application

- Power management



1.Source 2.Source 3.Source 4.Gate  
5.Drain 6.Drain 7.Drain 8.Drain  
DFN5060 Plastic Package

### Key Parameters

| Parameter               | Value                       | Unit |
|-------------------------|-----------------------------|------|
| BV <sub>DSS</sub>       | 80                          | V    |
| R <sub>DS(ON)</sub> Max | 4 @ V <sub>GS</sub> = 10 V  | mΩ   |
|                         | 4.2 @ V <sub>GS</sub> = 7 V |      |
| V <sub>GS(th)</sub> typ | 2.8                         | V    |
| Q <sub>g</sub> typ      | 89 @ V <sub>GS</sub> = 10 V | nC   |

### Absolute Maximum Ratings(at T<sub>a</sub> = 25°C unless otherwise specified)

| Parameter                                        | Symbol                            | Value         | Unit |
|--------------------------------------------------|-----------------------------------|---------------|------|
| Drain-Source Voltage                             | V <sub>DS</sub>                   | 80            | V    |
| Gate-Source Voltage                              | V <sub>GS</sub>                   | ± 20          | V    |
| Drain Current                                    | I <sub>D</sub>                    | 82.4          | A    |
|                                                  |                                   | 51.9          |      |
| Peak Drain Current, Pulsed <sup>1)</sup>         | I <sub>DM</sub>                   | 350           | A    |
| Avalanche Current                                | I <sub>AS</sub>                   | 19.1          | A    |
| Single Pulse Avalanche Energy <sup>2)</sup>      | E <sub>AS</sub>                   | 91.2          | mJ   |
| Power Dissipation                                | P <sub>tot</sub>                  | 44.9          | W    |
| Operating Junction and Storage Temperature Range | T <sub>J</sub> , T <sub>stg</sub> | - 55 to + 150 | °C   |

### Thermal Characteristics

| Parameter                                                 | Symbol           | Max. | Unit |
|-----------------------------------------------------------|------------------|------|------|
| Thermal Resistance from Junction to Case                  | R <sub>θJC</sub> | 2.7  | °C/W |
| Thermal Resistance from Junction to Ambient <sup>3)</sup> | R <sub>θJA</sub> | 40   | °C/W |

<sup>1)</sup> Pulse Test: Pulse Width ≤ 100 μs, Duty Cycle ≤ 2%, Repetitive rating, pulse width limited by junction temperature T<sub>J(MAX)</sub> = 150°C.

<sup>2)</sup> Limited by T<sub>J(MAX)</sub>, starting T<sub>J</sub> = 25 °C, L = 0.5 mH, R<sub>g</sub> = 25 Ω, I<sub>AS</sub> = 19.1 A, V<sub>GS</sub> = 10 V.

<sup>3)</sup> Device mounted on FR-4 substrate PC board, 2oz copper, with 1-inch square copper plate in still air.

**Characteristics at  $T_a = 25^\circ\text{C}$  unless otherwise specified**

| Parameter                                                                                                                                                                      | Symbol       | Min.   | Typ.     | Max.      | Unit             |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|--------|----------|-----------|------------------|
| <b>STATIC PARAMETERS</b>                                                                                                                                                       |              |        |          |           |                  |
| Drain-Source Breakdown Voltage<br>at $I_D = 250\ \mu\text{A}$                                                                                                                  | $BV_{DS}$    | 80     | -        | -         | V                |
| Drain-Source Leakage Current<br>at $V_{DS} = 64\ \text{V}$                                                                                                                     | $I_{DSS}$    | -      | -        | 1         | $\mu\text{A}$    |
| Gate Leakage Current<br>at $V_{GS} = \pm 20\ \text{V}$                                                                                                                         | $I_{GSS}$    | -      | -        | $\pm 100$ | nA               |
| Gate-Source Threshold Voltage<br>at $V_{DS} = V_{GS}$ , $I_D = 250\ \mu\text{A}$                                                                                               | $V_{GS(th)}$ | 2      | -        | 4         | V                |
| Drain-Source On-State Resistance<br>at $V_{GS} = 10\ \text{V}$ , $I_D = 30\ \text{A}$<br>at $V_{GS} = 7\ \text{V}$ , $I_D = 20\ \text{A}$                                      | $R_{DS(on)}$ | -<br>- | 3.2<br>- | 4<br>4.2  | $\text{m}\Omega$ |
| <b>DYNAMIC PARAMETERS</b>                                                                                                                                                      |              |        |          |           |                  |
| Forward Transconductance<br>at $V_{DS} = 5\ \text{V}$ , $I_D = 20\ \text{A}$                                                                                                   | $g_{fs}$     | -      | 46.1     | -         | S                |
| Gate Resistance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 0\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                    | $R_g$        | -      | 1.1      | -         | $\Omega$         |
| Input Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 40\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                 | $C_{iss}$    | -      | 5500     | -         | pF               |
| Output Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 40\ \text{V}$ , $f = 1\ \text{MHz}$                                                                                | $C_{oss}$    | -      | 833      | -         | pF               |
| Reverse Transfer Capacitance<br>at $V_{GS} = 0\ \text{V}$ , $V_{DS} = 40\ \text{V}$ , $f = 1\ \text{MHz}$                                                                      | $C_{rss}$    | -      | 63       | -         | pF               |
| Gate charge total<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 7\ \text{V}$ | $Q_g$        | -<br>- | 89<br>64 | -<br>-    | nC               |
| Gate to Source Charge<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$                                                                           | $Q_{gs}$     | -      | 25       | -         | nC               |
| Gate to Drain Charge<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$                                                                            | $Q_{gd}$     | -      | 20       | -         | nC               |
| Turn-On Delay Time<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_g = 3.3\ \Omega$                                                        | $t_{d(on)}$  | -      | 35.5     | -         | ns               |
| Turn-On Rise Time<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_g = 3.3\ \Omega$                                                         | $t_r$        | -      | 50       | -         | ns               |
| Turn-Off Delay Time<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_g = 3.3\ \Omega$                                                       | $t_{d(off)}$ | -      | 29       | -         | ns               |
| Turn-Off Fall Time<br>at $V_{DS} = 40\ \text{V}$ , $I_D = 30\ \text{A}$ , $V_{GS} = 10\ \text{V}$ , $R_g = 3.3\ \Omega$                                                        | $t_f$        | -      | 11       | -         | ns               |
| <b>Body-Diode PARAMETERS</b>                                                                                                                                                   |              |        |          |           |                  |
| Drain-Source Diode Forward Voltage<br>at $I_S = 1\ \text{A}$ , $V_{GS} = 0\ \text{V}$                                                                                          | $V_{SD}$     | -      | -        | 1.2       | V                |
| Body-Diode Continuous Current                                                                                                                                                  | $I_S$        | -      | -        | 82.4      | A                |
| Body-Diode Continuous Current, Pulsed                                                                                                                                          | $I_{SM}$     | -      | -        | 350       | A                |
| Body Diode Reverse Recovery Time<br>at $I_S = 30\ \text{A}$ , $di/dt = 200\ \text{A} / \mu\text{s}$                                                                            | $t_{rr}$     | -      | 43.5     | -         | ns               |
| Body Diode Reverse Recovery Charge<br>at $I_S = 30\ \text{A}$ , $di/dt = 200\ \text{A} / \mu\text{s}$                                                                          | $Q_{rr}$     | -      | 98.8     | -         | nC               |

## Electrical Characteristics Curves

Fig. 1 Typical Output Characteristics

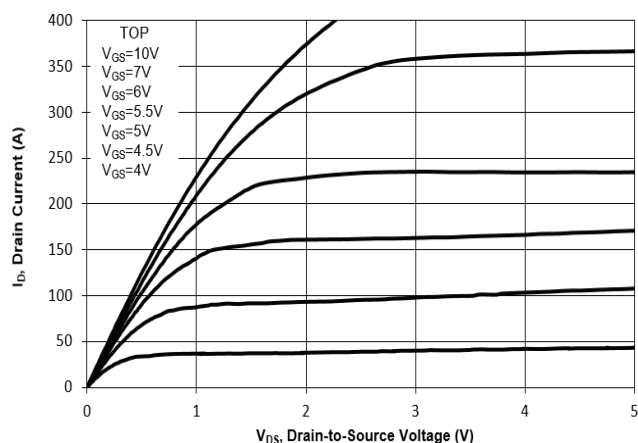


Fig. 2 Typical Transfer Characteristics

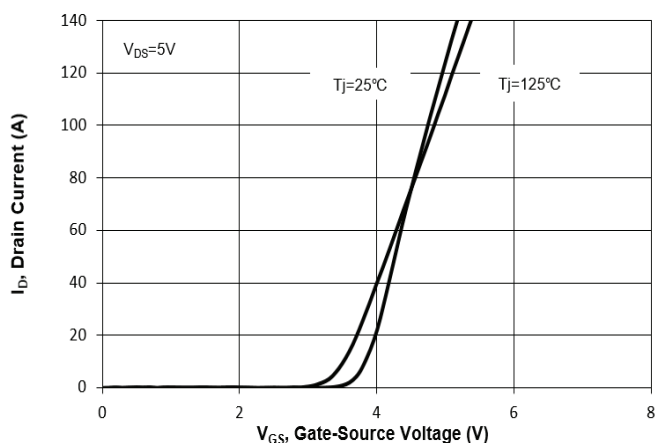


Fig. 3 On-Resistance vs. Drain Current

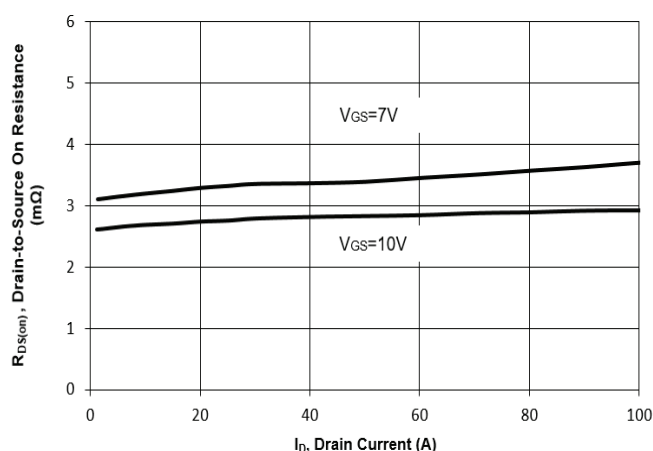


Fig. 4 On-Resistance vs. Gate to Source Voltage

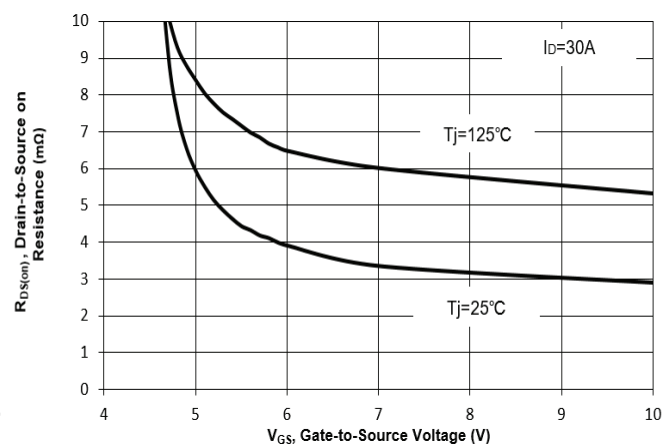


Fig. 5 On-Resistance vs.  $T_J$

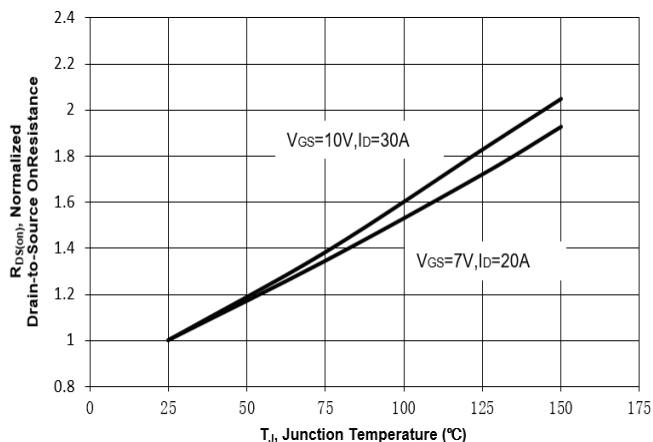
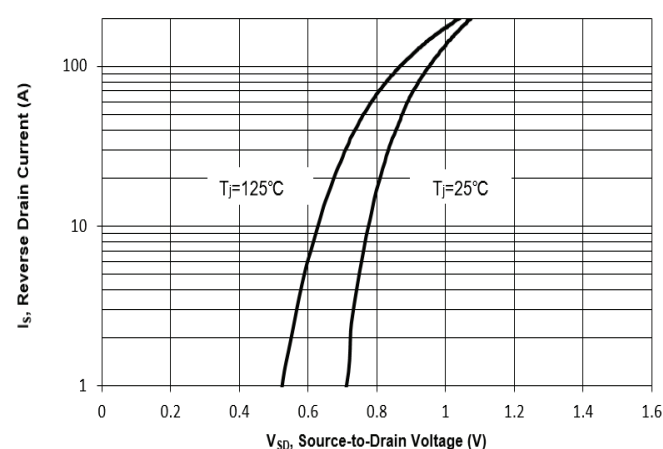


Fig. 6 Typical Body-Diode Forward Characteristics



## Electrical Characteristics Curves

Fig. 7 Typical Junction Capacitance

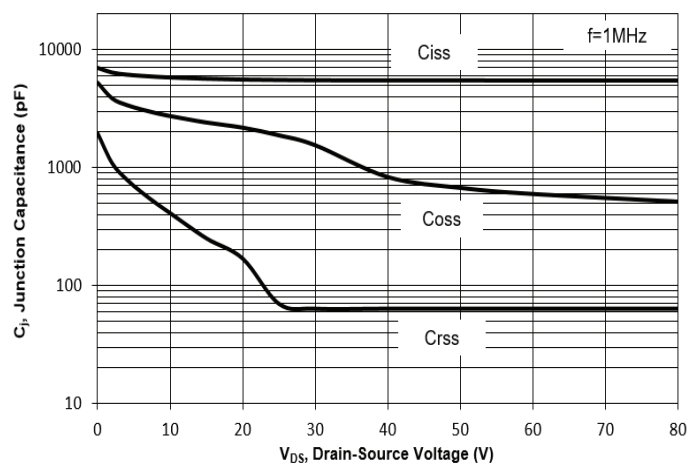


Fig. 8 Drain-Source Leakage Current vs. T<sub>J</sub>

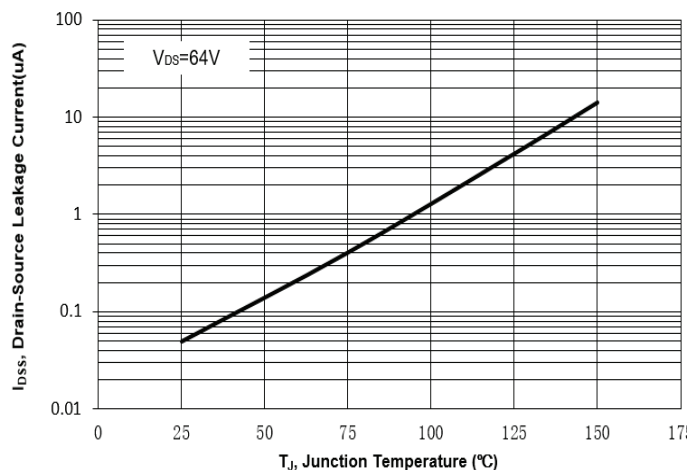


Fig. 9 V<sub>(BR)DSS</sub> vs. Junction Temperature

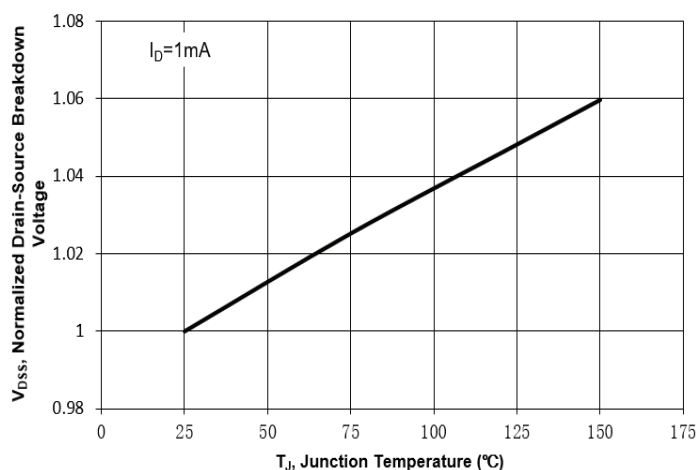


Fig. 10 Gate Threshold Variation vs. T<sub>J</sub>

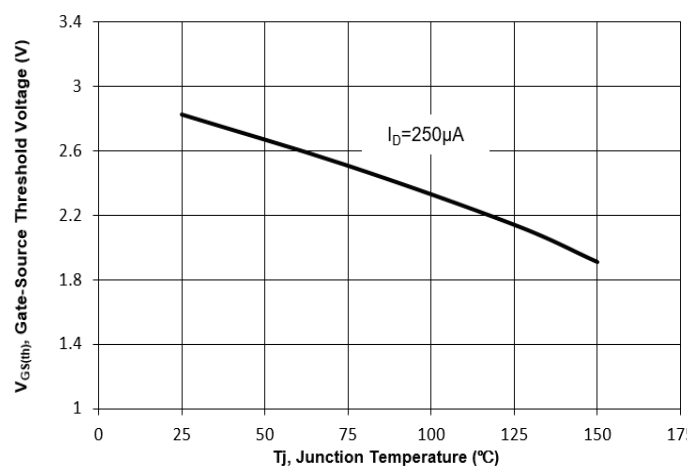


Fig. 11 Gate Charge

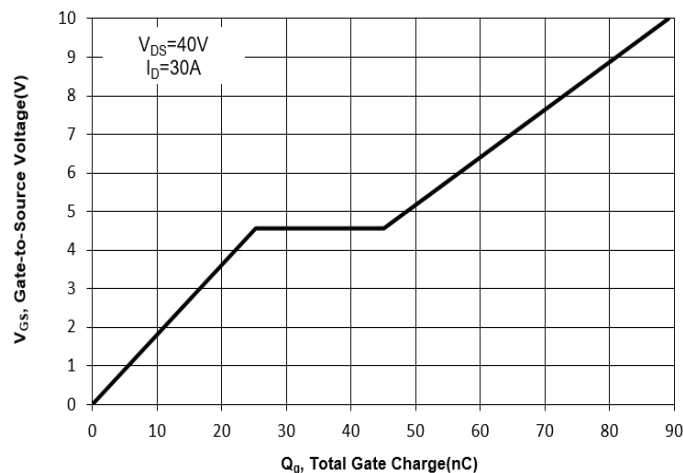


Fig. 12 Safe Operation Area

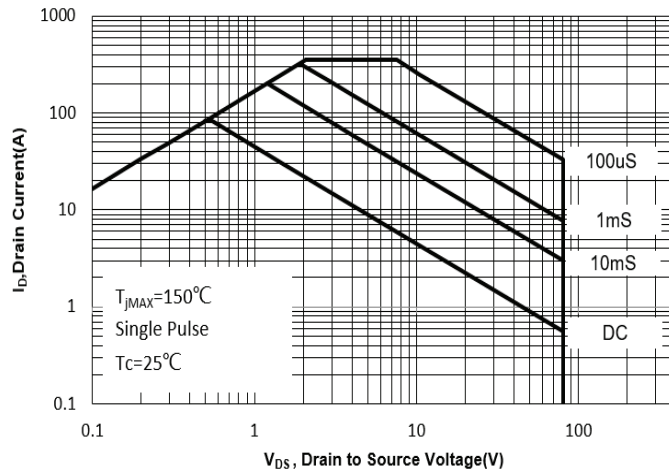


Fig.13 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JC}$ )

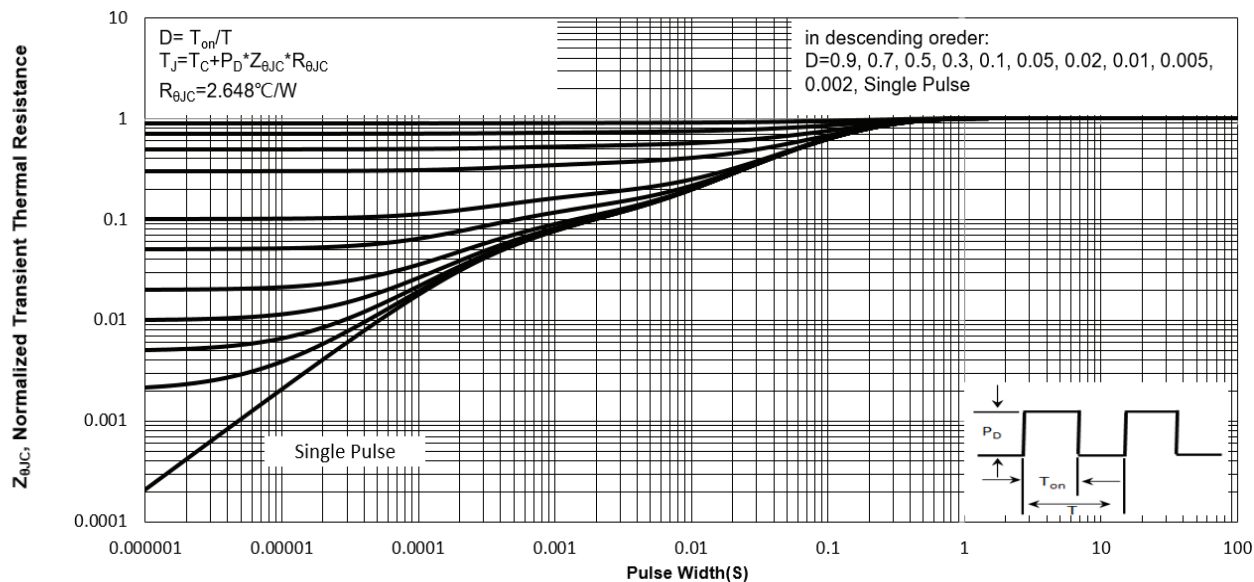
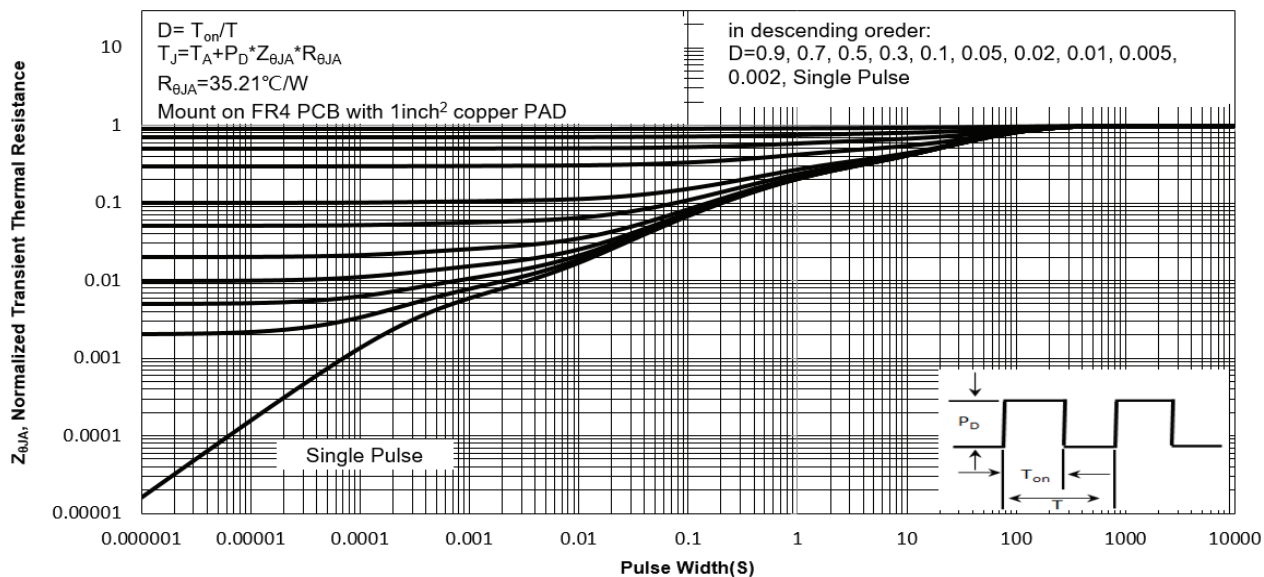
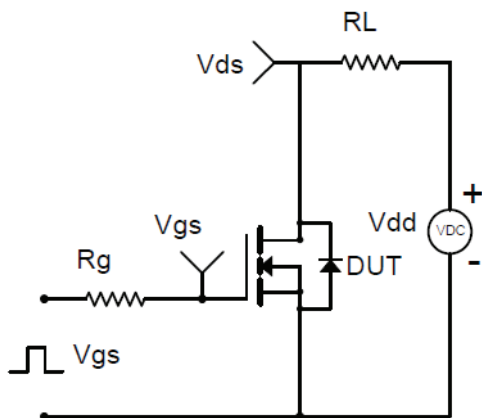
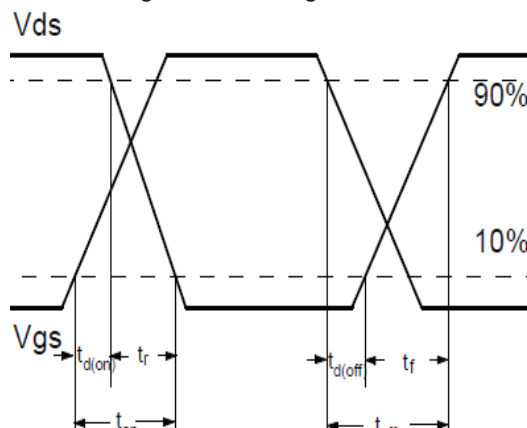
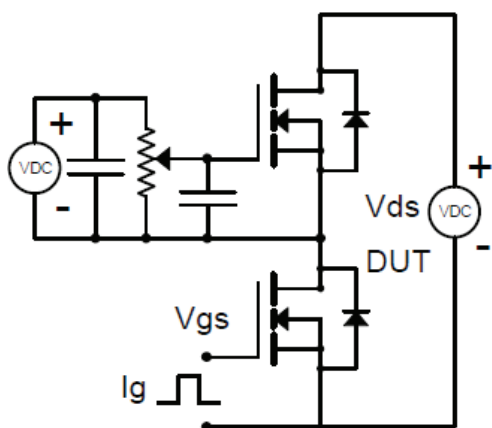
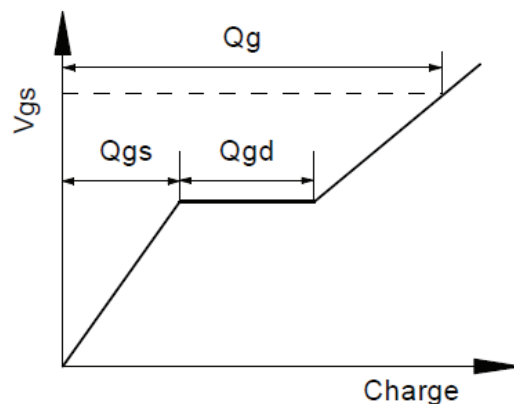
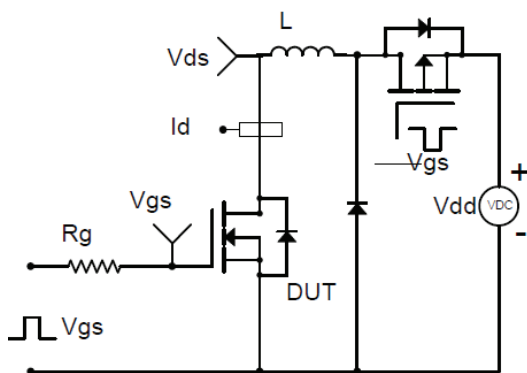
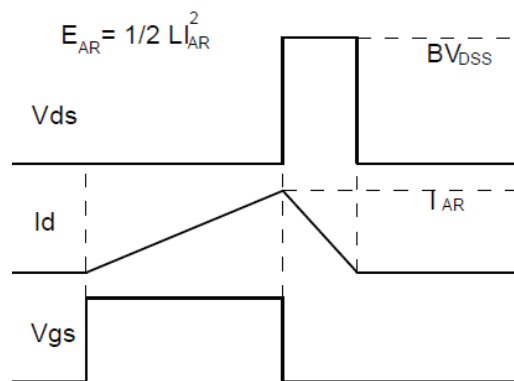


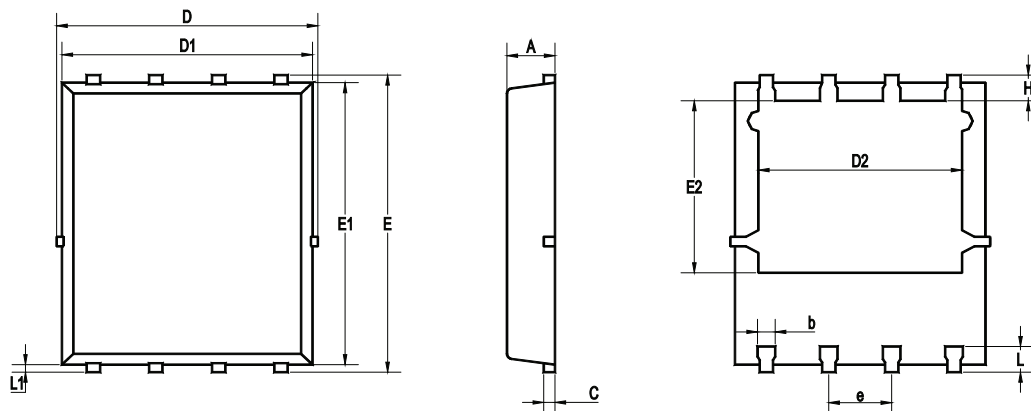
Fig.14 Normalized Maximum Transient Thermal Impedance( $Z_{\theta JA}$ )



**Test Circuits**
**Fig.1-1 Switching times test circuit**

**Fig.1-2 Switching Waveform**

**Fig.2-1 Gate charge test circuit**

**Fig.2-2 Gate charge waveform**

**Fig.3-1 Avalanche test circuit**

**Fig.3-2 Avalanche waveform**


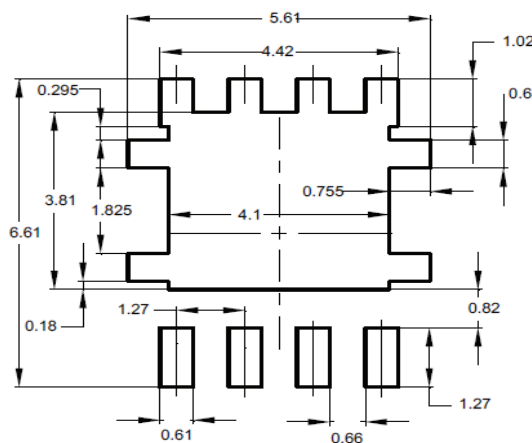
Package Outline Dimensions (Units: mm)

DFN5060



| UNIT | A           | b            | C            | D           | D1         | D2          | E            | E1       | E2           | e            | L            | L1          | H            |
|------|-------------|--------------|--------------|-------------|------------|-------------|--------------|----------|--------------|--------------|--------------|-------------|--------------|
| mm   | 1.12<br>0.9 | 0.51<br>0.33 | 0.34<br>0.11 | 5.26<br>4.7 | 5.1<br>4.7 | 4.5<br>3.56 | 6.25<br>5.75 | 6<br>5.6 | 3.66<br>3.18 | 1.37<br>1.17 | 0.71<br>0.35 | 0.2<br>0.06 | 0.71<br>0.35 |

Recommended Soldering Footprint



Packing information

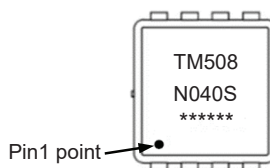
| Package | Tape Width (mm) | Pitch   |               | Reel Size |      | Per Reel Packing Quantity |
|---------|-----------------|---------|---------------|-----------|------|---------------------------|
|         |                 | mm      | inch          | mm        | inch |                           |
| DFN5060 | 12              | 8 ± 0.1 | 0.315 ± 0.004 | 330       | 13   | 5,000                     |

Marking information

" TM508N040S " = Part No.

" \*\*\*\*\* " = Date Code Marking

Font type: Arial



Disclaimer: Our company reserve the right to make modifications, enhancements, improvements, corrections or other changes to improve product design, functions and reliability, anytime without notice.